

(礦物部分共 50 分)

一、簡答題：

下列是摘自礦物學課本對 Anhydrite 之描述性資料，請在詳細閱讀後按照題號簡單且完整的回答本題的 10 個小題。(注意：除專有名詞可寫英文外，照抄英文得零分)【共 20 分】

**Anhydrite—CaSO<sub>4</sub>**

**Crystallography.** Orthorhombic.  $2/m2/m2/m$ . Crystals are rare; when observed are thick tabular on {010}, {100}, or {001} (see Fig. 1), also prismatic parallel to  $b$ . Usually massive or in crystalline masses resembling an isometric mineral with cubic cleavage. Also fibrous, granular, massive.

**Amma;**  $a = 6.95, b = 6.96, c = 6.21 \text{ \AA}; Z = 4. d_s:$  3.50(10), 2.85(3), 2.33(2), 2.08(2), 1.869(2).

**Physical Properties.** Cleavage {010} perfect, {100} nearly perfect, {001} good.  $H 3-3\frac{1}{2}$ .  $G 2.89-2.98$ . Luster vitreous to pearly on cleavage. Color colorless to gray to bluish or violet. Also may be white or tinged with rose, brown, or red. Optics: (+);  $\alpha = 1.570, \beta = 1.575, \gamma = 1.614; 2V = 44^\circ; X = b, Y = a; r < v$ .

**Composition and Structure.** CaO 41.2, SO<sub>3</sub> 58.8%. The structure is very different from the barite type. In anhydrite, Ca is in 8-coordination with oxygen from SO<sub>4</sub> groups, whereas in barite, Ba is in 12-coordination with

oxygen. A metastable polymorph of anhydrite ( $\gamma\text{CaSO}_4$ ) is hexagonal and is formed as the result of slow dehydration of gypsum.

**Diagnostic Features.** Anhydrite is characterized by its three cleavages at right angles. It is distinguished from calcite by its higher specific gravity and from gypsum by its greater hardness. Some massive varieties are difficult to recognize but often appear "sugary," and one should test for sulfate.

**Alteration.** Anhydrite by hydration, at lower temperatures, changes to gypsum with an increase in volume, and in places large masses have been altered in this way.

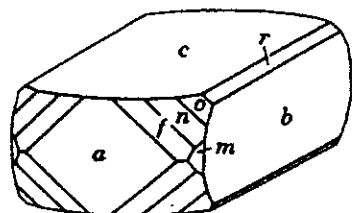
**Occurrence.** Anhydrite occurs in similar settings as gypsum and is often associated with gypsum but is not nearly as common. Found in beds associated with salt deposits in the cap rock of salt domes, and in limestones. Found in some amygdaloidal cavities in basalt.

Notable localities are: Wieliczka, Poland; Aussee, Styria, and Hall near Innsbruck, Tyrol, Austria; and Bex, Switzerland. In the United States, found in Lockport, New York; West Paterson, New Jersey; New Mexico; and Texas. Found in large beds in Nova Scotia.

**Use.** Ground anhydrite is used as a soil conditioner and to a minor extent as a setting retardant in Portland cement. In Great Britain and Germany, it has been used as a source of sulfur for the production of sulfuric acid.

**Name.** Anhydrite is from the Greek word meaning *without water*, in contrast to the more common hydrous calcium sulfate, gypsum.

FIG. 1 Anhydrite.



1. Anhydrite 的中文名稱是什麼？屬於哪一個晶系？
2. Anhydrite 屬於哪個點群？哪個空間群？
3. Anhydrite 的比重是多少？硬度是多少？
4. Anhydrite 有幾組解理？哪一組最好？
5. Anhydrite 的一個晶胞中含有多少個氧原子？具有什麼光澤？
6. Anhydrite 的折射率最高可達到多少？最強 X 光繞射發生在哪一晶面間距？  
(答案應附單位；單位錯誤得 0 分)
7. Anhydrite 與 calcite 或與 gypsum 分別有什麼明顯鑑定特徵？
8. Anhydrite 可以在某些玄武岩的什麼結構內發現？Fig.1 的 anhydrite 晶體有幾個晶面？

見背面

9. Anhydrite 可以用來製造化學實驗室中哪一種常見的酸？Gypsum 經由慢脫水反應生成的 anhydrite 亞穩定相是什麼？

10. Anhydrite 名稱是從哪種文字來的？原文代表什麼意思？

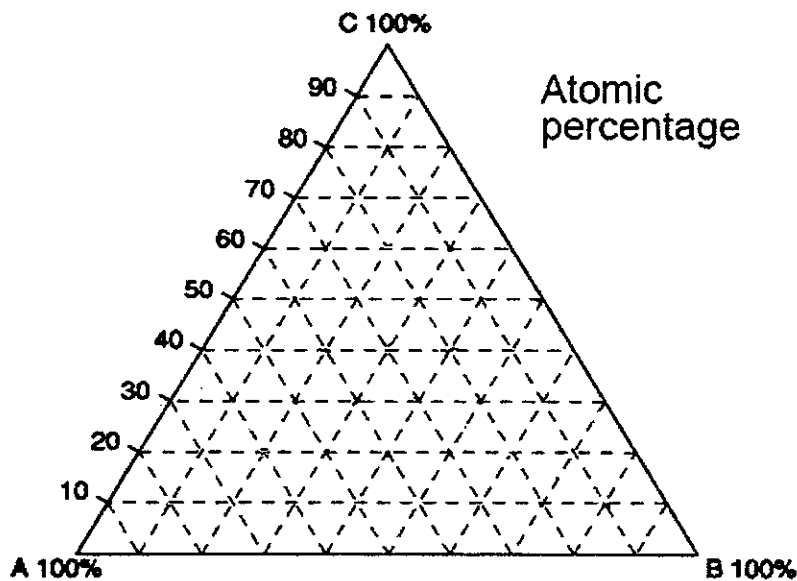
二、題組：【三小題各 5 分，共 15 分】

1. 下圖是 A, B 與 C 的三個端成分圖。請將圖描繪到答案卷上，並準確標示出以下 5 個成分的位置：①  $A_{50}B_{50}$ ，②  $A_{30}B_{20}C_{50}$ ，③  $A_{40}B_{30}C_{30}$ ，④  $A_{80}B_{10}C_{10}$ ，

⑤  $A_{10}B_{80}C_{10}$ 。

2. 如果指定三個端成分 A 為  $NaAlSi_3O_8$ ，B 為  $CaAl_2Si_2O_8$ ，C 為  $KAlSi_3O_8$ ，則在上面 5 個成分（此時變成 molecular percentage）中，自然界不會存在哪幾個成分的礦物？

3. 不會存在的原因為何？



三、解釋名詞：【每題 5 分，共 15 分】

1. Corundum
2. Hexagonal system
3. Symmetry element

(岩石部分共 50 分)

四、簡答題：【選擇題每題 2 分，配合題 10 分；共 14 分】

1. [選擇題] 在碳酸鹽補償深度 (Carbonate compensation depth) 以下的遠洋沉積物中，下列哪些生物的殘骸會是其組成？(注意：寫出選項編號即可)  
(A) Coccolith (B) Coral (C) Diatom (D) Foraminifer (E) Radiolaria
2. [選擇題] 下列哪一礦物的出現是造成藍片岩 (Blueschist) 呈現藍色的主要因素？(注意：寫出選項編號即可)  
(A) Garnet (B) Glauconite (C) Glaucophane (D) Kyanite (E) Sillimanite
3. [配合題] 分別寫出下列構造所對應的 (三大) 岩類。
  - (1) Spinifex texture
  - (2) Boudinage
  - (3) Dust rings
  - (4) Poikilitic texture
  - (5) Porphyroblast

五、問答題：【每題 8 分，共 24 分】

1. 分別說明如何利用 (1) 地球化學主量元素組成以及 (2) 礦物組成，分辨矽質玄武岩 (Tholeiitic basalts 或 Tholeiites) 與鹼性玄武岩 (Alkaline basalts)。
2. 簡述砂岩的分類。
3. 解釋葉理 (Foliation) 是如何形成的，以及為何變質岩不一定具有葉理。

六、解釋名詞：【每題 4 分，共 12 分】

1. Cement
2. Contact metamorphism
3. Partial melting

試題隨卷繳回